BRIEFER ARTICLES

PHYSICAL CONDITIONS IN SPHAGNUM BOGS

The experimental data collected by Professor HENRY J. COX[1] of the United States Weather Bureau in regard to frost and temperature conditions in cranberry marshes do not seem to have received attention from reviewers of botanical literature, and their bearing on the causes of the peculiar flora of sphagnum bogs seems to have been overlooked. With a view to protecting the cranberry crop in cultivated marshes by predicting frost and thus enabling the growers to avoid danger to the crop by flooding the marshes, he conducted a very thorough investigation of frost and temperature conditions in the bogs of Wisconsin. He also secured some data on bogs in Massachusetts, New Jersey, and Washington. The following facts, which seem to have an important bearing on the possible causes of the inhibition from sphagnum bogs of plants other than bog xerophytes, have been summarized from his bulletin.

A. AIR TEMPERATURES

1. *Comparison of bog with hard land.*—The mean minimum temperatures of the air at station 2 (in the bog over a dense growth of saturated sphagnum) and at station 9 (over sandy loam in a garden at the border of the bog, elevation of the surface of the soil approximately 10 feet above the surface of the bog) for May, June, July, August, September, and October 1907, at Mather, Wisconsin, were as follows (table 18, p. 81):

	Station 2	Station 9
Surface	41.9	45.6
$2\frac{1}{2}$ inches above surface	40.4	44.7
5 inches above surface	40.2	44.8
$7\frac{1}{2}$ inches above surface	40.7	44.9
10 inches above surface	40.9	44.9
12 inches above surface	40.9	44.9
15 inches above surface	41.2	44.9
36 inches above surface	43.3	45.1

[1] COX, HENRY J., Frost and temperature conditions in the cranberry marshes of Wisconsin. Bulletin T, U.S. Dept. Agric., Weather Bureau. 1910.

2. *Comparison of sphagnum with bare peat.*—The mean minimum temperatures of the air at station 7 (bare surface of peat in the center of a scalped area 10 feet square in an uncultivated portion of the bog) and at station 7*a* (over sphagnum moss at a distance of 5 or 6 feet from station 7) for September 1906, at Mather, Wisconsin, were as follows (table 4, p. 46):

	Station 7	Station 7*a*
Surface	49.0	43.4
5 inches above surface	44.2	43.7

B. SOIL TEMPERATURES

The mean minimum temperatures of the soil for May, June, July, August, September, and October 1907, at Mather, Wisconsin, were as follows:

1. *Comparison of bog with hard land* (table 19, p. 82).—

	Station 2	Station 9
At depth of 3 inches at 6 P.M.	54.4	64.8
" " " 3 " " 7 A.M.	52.7	54.7
" " " 6 " " 6 P.M.	53.3	63.9
" " " 6 " " 7 A.M.	53.3	56.2

Cox (p. 119) says "frost remains in the soil of an unflooded bog until comparatively late in the season, and there have been found instances of frost in the soil in marshes as late as July 4."

2. *Comparison of sphagnum moss with bare peat* (table 4, p. 45) for September 1906, at Mather, Wisconsin.—

	Station 7	Station 7*a*
At depth of 3 inches at 6 P.M.	65.8	61.3
" " " 3 " " 7 A.M.	59.7	61.1

C. DIFFERENCES BETWEEN TEMPERATURE OF AIR AND OF SOIL ON BOG AND HARD LAND (Mather, Wisconsin, May 13—October 31, 1907)

1. *Mean temperature of soil obtained by averaging the mean at 6 P.M. with that at 7 A.M.* (table 19, p. 82).—

	Station 2 (sphagnum)	Station 9 (loam)
a) 3-inch depth	53·5	59·7
b) 6-inch depth	53·3	60.0

2. *Mean temperature of air obtained by averaging the mean maximum with the mean minimum in each case.*—Data from table 17, p. 78, table 13*a*, p. 69, and a letter to the reviewer from Professor Cox.

	Station 2	Station 9
c) Surface of soil	62.8	64.8
d) 5 inches above surface	61.1	62.2
e) 36 inches above surface	61.0	60.5

3. *Comparison of differences.*—

	Station 2	Station 9
a and *c*	9·3	5.1
a and *d*	7.6	2.5
a and *e*	7·5	0.8
b and *c*	9·5	4.8
b and *d*	7.8	2.2
b and *e*	7·7	0.5

It thus appears that in all possible comparisons there was a much greater difference between the temperature of the air and that of the soil on the bog than on the neighboring hard land.

D. WIND VELOCITY

The following facts regarding the mean velocity of the wind over the upland and over the marsh in miles per hour for the

months of May, June, July, August, September, and October 1907, at Mather, Wisconsin, are given in tables 15 and 15*a*, p. 74.

Upland	9.0
Marsh	4.5

Anemometer on warehouse (upland) 32 ft. 7 in. above ground. Anemometer on marsh 4 ft. 7 in. above ground (station 4). Anemometer on warehouse 50 ft. 5 in. above surface of marsh at station 4. Difference between elevation of anemometers, 45 ft. 10 in.

E. RELATIVE HUMIDITY

The following are the data for Mather, Wisconsin, May 13—October 31, 1907 (table 21, pp. 98–112). At 7 P.M. the mean relative humidity for the month was higher on the bog than on the upland for every month, the mean excess of the bog over the upland being 9.5 per cent. At 7. A.M. the mean was greater on the bog than on the upland for every month except June, when the two were equal. Considered by days the relative humidity of the bog at 7 A.M. was greater than that of the upland on 67.9 per cent of the days of the whole season, and equal to it on 8.7 per cent of the days. At 7 P.M. it was greater on the bog on 88.9 per cent of the days and equal on 4.7 per cent.

CONCLUSIONS

1. The temperature conditions in both soil and air are less favorable for plants in the bog than on the neighboring hard land.

2. Temperature conditions are less favorable for plants in sphagnum moss than in bare peat.

3. In so far as a difference of temperature between air and soil is unfavorable for plants, the conditions in a sphagnum bog are much less favorable than in the neighboring hard land.

4. The conditions, so far as relative humidity is concerned, were less favorable for transpiration on the bog than on the neighboring hard land.

5. While the difference in wind velocity would also tend to indicate less favorable conditions for transpiration on the bog than on the neighboring hard land, the difference in the height of the two instruments must be taken into account.

The conclusions are those of the reviewer. Some of the data have also been rearranged in order to bear on the problem of the possible factors in the general inhibition from sphagnum bogs of plants other than bog xerophytes.—GEORGE B. RIGG, *University of Washington, Seattle, Wash.*